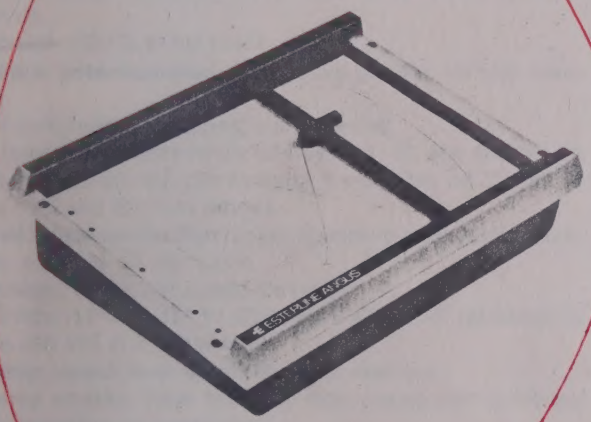
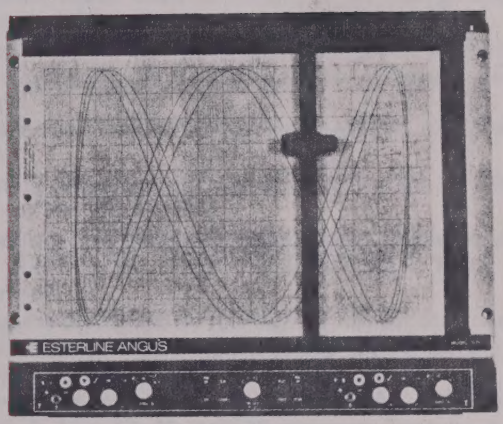
INSTRUCTION MANUAL FOR Esterline Angus Spartan X-Y recorder



XY575-BASIC (OEM)



XY575-LAB

ESTERLINE ANGUS

AN ESTERLINE COMPANY

BASIC INSTRUMENT SPECIFICATIONS

NOTE: For LAB instrument specifications, refer to SECTION 6 of manual.

celeration: 1500 in/sec/sec, nominal (38 m/sec/sec), oth axes.
Accuracy: ±0.25% of full scale.
Common mode rejection: 130 dB at DC.
Common mode voltages: 200 VDC to ground and between channels.
Deadband: ±0.1% of full scale.
Feedback potentiometer: Conductive plastic, infinite resolution.
Input configuration: Floating, single ended.
Input impedance: Essentially infinite on 1, 10, and 100 mV/in or 0.5, 5, and 50 mV/cm ranges; 1 megohm on 1 and 10 V/in or 0.5 and 5 V/cm ranges.
Internal adjustments: Servo gain, damping and variable sensitivity controls on each axis.
Overshoot: 1% of full scale, maximum.
Paper size: 11" H x 17" W (279 mm x 432 mm). Optional A3 size is 300 mm H x 420 mm W.
Pen drop repeat rate: 45 cycles/sec, nominal.
Pen drop control: Rear terminal strip connection (external switch supplied by customer).
Power requirements: 115 V or 230 V ±10%, 60 Hz, standard, 48-62 Hz rating is optional.
Repeatability: ±0.1% of full scale.
Standard sensitivities: 1 mV/in, 10 mV/in, 100 mV/in, 1V/in 10 V/in, or 0.5 mV/cm, 5 mV/cm, 50 mV/cm, 0.5 V/cm and 5V/cm. Variable sensitivity. +10%, 0% of basic range.
Signal input connections: Rear terminal strip, standard.
Size: 19" x 14" x 6" (482 mm x 356 mm x 152 mm).
Slewing speed: 45 in/sec (1143 mm/sec) or faster.
Step response: 0.3 sec for 10 in (250 mm), both axes.
Temperature range (ambient) for rated specifications: 23° ±5°C.
Temperature range (operating): 10° to 40°C.
Weight: 14 lbs (6.4 kg).
Zero control: Customer supplied external potentiometer or internal 10 turn potentiometer, accessible from rear.
Zero offset: ±100% of full scale.

OPTION SPECIFICATIONS:

Event marker input: External switch or DC voltage causes pen deflection. Both X and Y axes available.
Deflection = 0.1 in/5 VDC. Input impedance = 1 megohm, minimum. Internal 15 VDC supply for external switch operation.
Power cord: 6 ft (1.8 m) three-wire cord with strain-relief hardware.
Power rating (universal): Provides for 115 or 230 V (±10%) and 48 to 62 Hz power sources.
Retransmitting potentiometer (either axis): Conductive plastic, 5000 ohms ±10%. 10 VDC max excitation, 1 mA max wiper current.
Remote quick-disconnector for: Pen up/down, zero control pots, event marker, signal inputs, sweep start and reset, retransmitting potentiometer(s).
Time base: Plug-in card with .01, .05, 0.1, 0.5, 1.0 and 2.0 in/sec, or .2, 1, 2, 10, 20, and 40 mm/sec. Time base accuracy. ±2% over operating range.
TTL logic inputs control functions: Provides 5 VDC TTL level control of pen drop and sweep control, as applicable.
Grid mask: Provides optimum vacuum hold-down for 8½" x 11" (215mm x 279mm) paper, when installed over vacuum grid.

Accessories (standard):
One package of six ink cartridges, one package of 100 sheets of graph paper, one operating and maintenance manual.

Accessory kit (optional): Includes one package of six red ink cartridges, one recorder dust cover, and two signal input cables with plug terminals.

1612 — Time Base 291

SECTION 1— DESCRIPTION

1.1 INTRODUCTION

a. This instruction manual describes the basic X-Y graphic recorder offered in the Esterline Angus SPARTAN instrument line. These instructions include a general description, installation, operating procedures, wiring diagrams, and a complete replacement parts list for the Model XY-575 Recorder.

> NOTE: For information which is specific to the Model XY575-LAB recorder only, refer to SECTION 6 of manual.

b. Do not attempt to operate the instrument until you have thoroughly acquainted yourself with its features and operating techniques. Failure to follow recommended procedures may result in unsatisfactory operation or in damage to vital parts of the instrument.

c. Separate instructions or drawings supplied with this manual may contain information on optional accessories and attachments, or additional documentation that is required for special customized modifications.

> NOTE: If supplemental documentation conflicts with statements in this basic manual, the supplemental data shall be considered authoritative.

d. For a complete detailed description of your particular recorder, refer to the Data Sheet originally supplied with the instrument.

1.2 GENERAL DESCRIPTION

a. *SPARTAN* X-Y Recorders are precision general-purpose instruments designed to plot Cartesian coordinate graphs through the use of independent horizontal (X-axis) and vertical (Y-axis) internal measuring systems. The relationship between two analog

functions (represented by DC or low-frequency AC voltages) may be measured and graphically recorded on all models. In addition, models equipped with the internal time base option can also plot any Y-axis function in relationship to a known time rate on the X-axis.

b. The instrument employs an entirely new design concept in its Y-axis shuttle assembly. This *"Uniglide"* module contains not only a snap-in disposable ink cartridge but also an electrical pen-drop solenoid. Drive positioning cables carry controlling power to the solenoid so that the recording pen tip can be lowered and lifted rapidly by the operator. This capability makes possible combinations of solid and broken line traces. Another design feature is the illuminated graticules that are used to align the graph grid rather than the edge of X-Y paper.

c. Model XY-575 Recorders are available in either English (inch) or Metric (centimeter) calibrations. The basic instrument is without front-panel controls, but provides either internal connection terminals or an optional remote connector for all operating functions. This simplicity feature increases the versatility of the instrument when it is to be interfaced with other equipment.

NOTE: Refer to SECTION 6 for a description of the Control Module used in the Model XY575-LAB recorder.

1.3 PRINCIPLES OF OPERATION

a. The instrument is designed to simultaneously measure and record two independent variables by electro-mechanical positioning of a single inking pen on calibrated graph paper. Vertical disposition of the recording pen is controlled by the instruments Y-axis system, while the pen is positioned horizontally by the X-axis system.

Since the functional components of each system are basically the same, the following discussion will be limited to only one recording axis.

b. A basic system configuration is illustrated in the block diagram of Figure 1-1. Although the overall system operates on a null-balance principle, its functional stages may be divided into two major sections: (1) the input signal-conditioning circuits--which include preamplification, range components, and zero adjustment; and (2) the servo measurement loop--which includes servo signal amplification, a DC balance motor, and a feedback network.

NOTE: For block diagram of LAB recorder, refer to Figure 6-2 in SECTION 6 of manual.

1.3.1 Signal Conditioning Circuits

a. As shown in Figure 1-1, the input signal voltage is first applied to an R-C rejection filter to reduce power line pickup. The signal is then passed on to range determining preamp stage IC1. Here, the input signal is amplified and resistor R_R is chosen for the desired range of sensitivity. Although direct signal coupling is used on all MV input sensitivities, additional divider resistors are required for voltage input ranges. Span Adjust R3 is used to trim the selected range accuracy.

b. Preamplified signal voltage e_S is next coupled to one input section of differential amplifier IC2. The other input section of this stage receives an offset potential E_O. This voltage is established by manual adjustment of 10-turn Zero pot R_Z. The zero control is used to position the recording pen at the zero reference point on the graph paper, or to elevate or suppress zero as much as 100% of the graphic scale. Stability is maintained in the offset circuitry through the use of fixed bias voltages from the regulated reference supply.

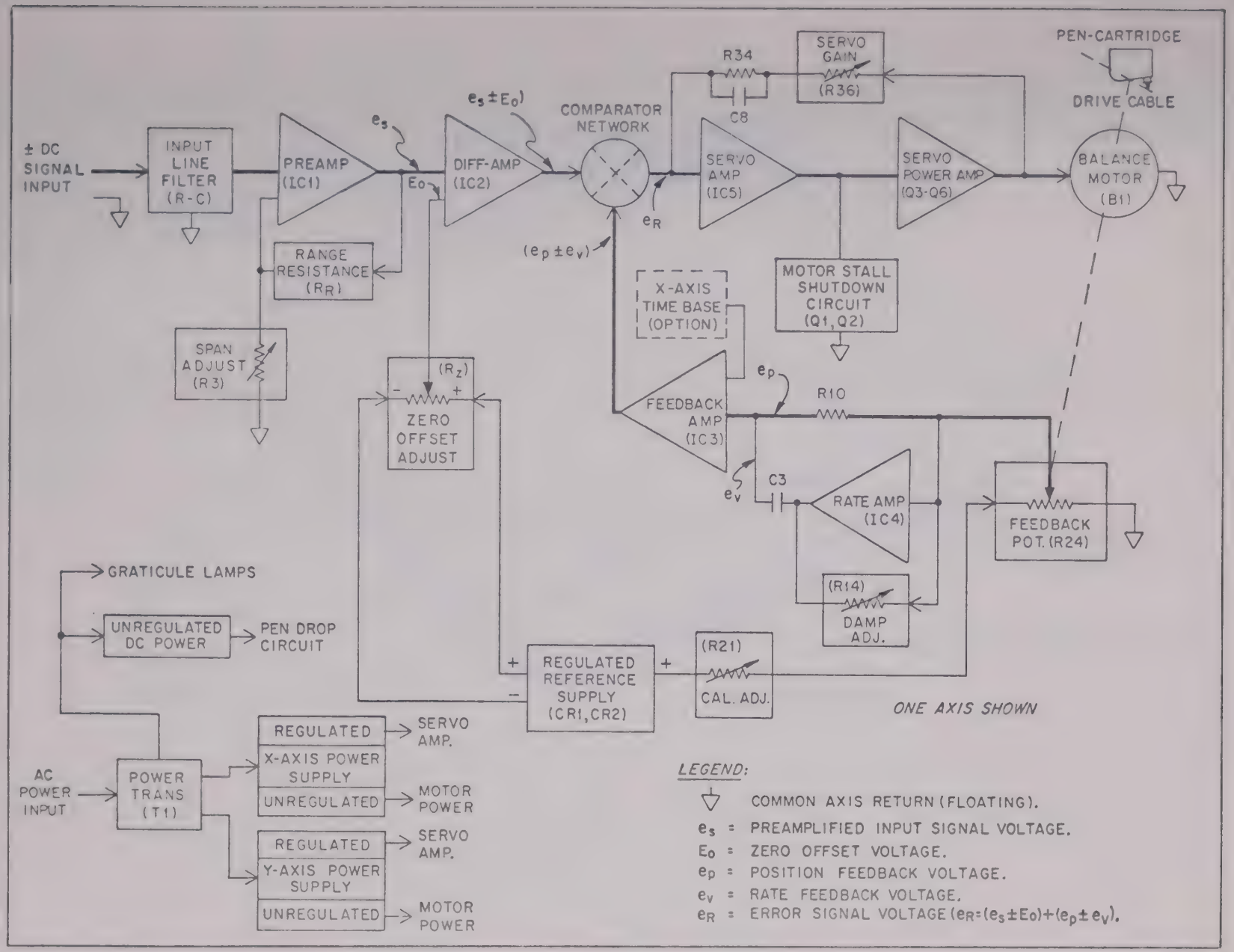


Figure 1-1. Simplified Block Diagram of Basic Recorder.

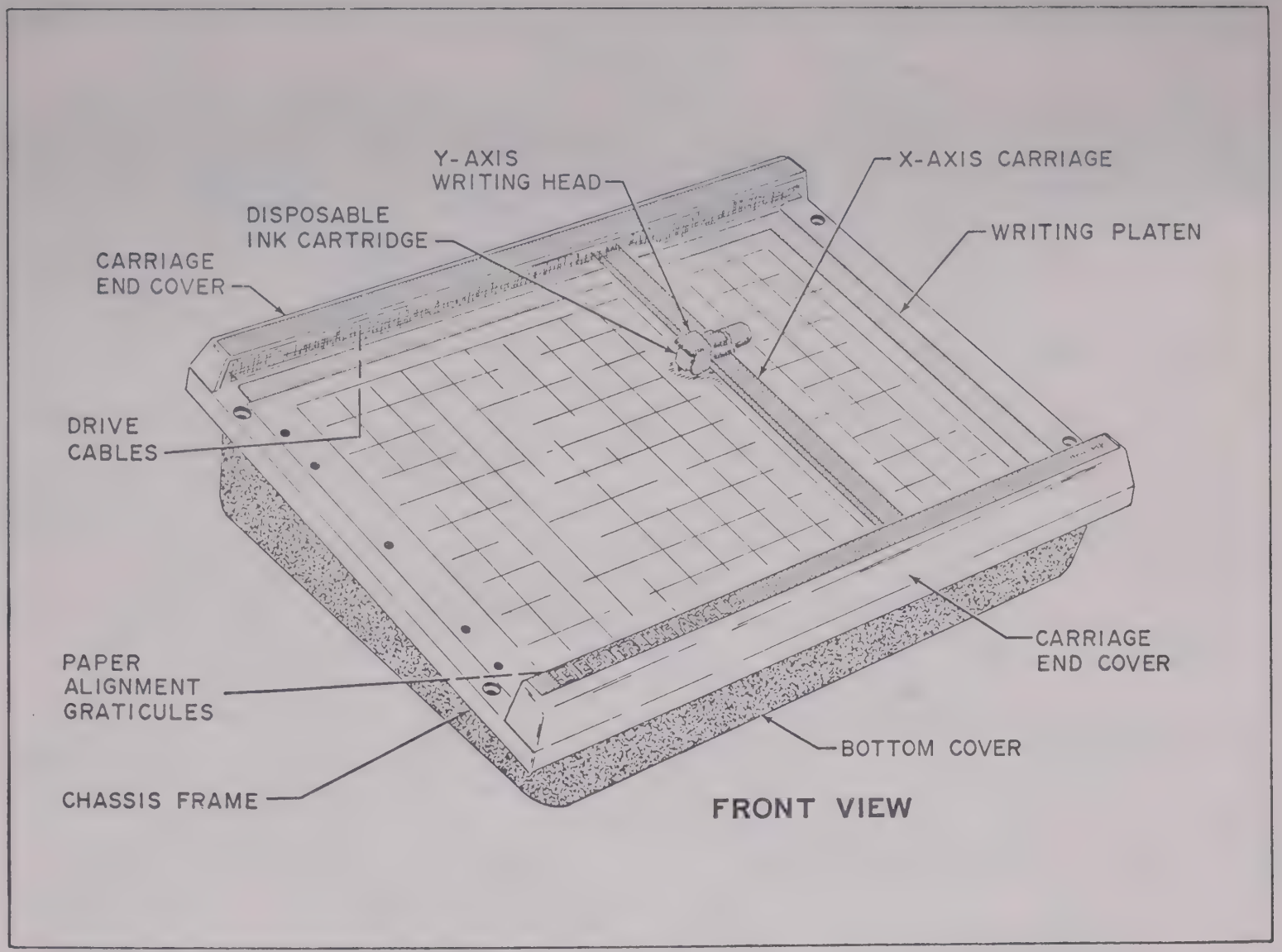


Figure 1-2A. Location of Major Components.

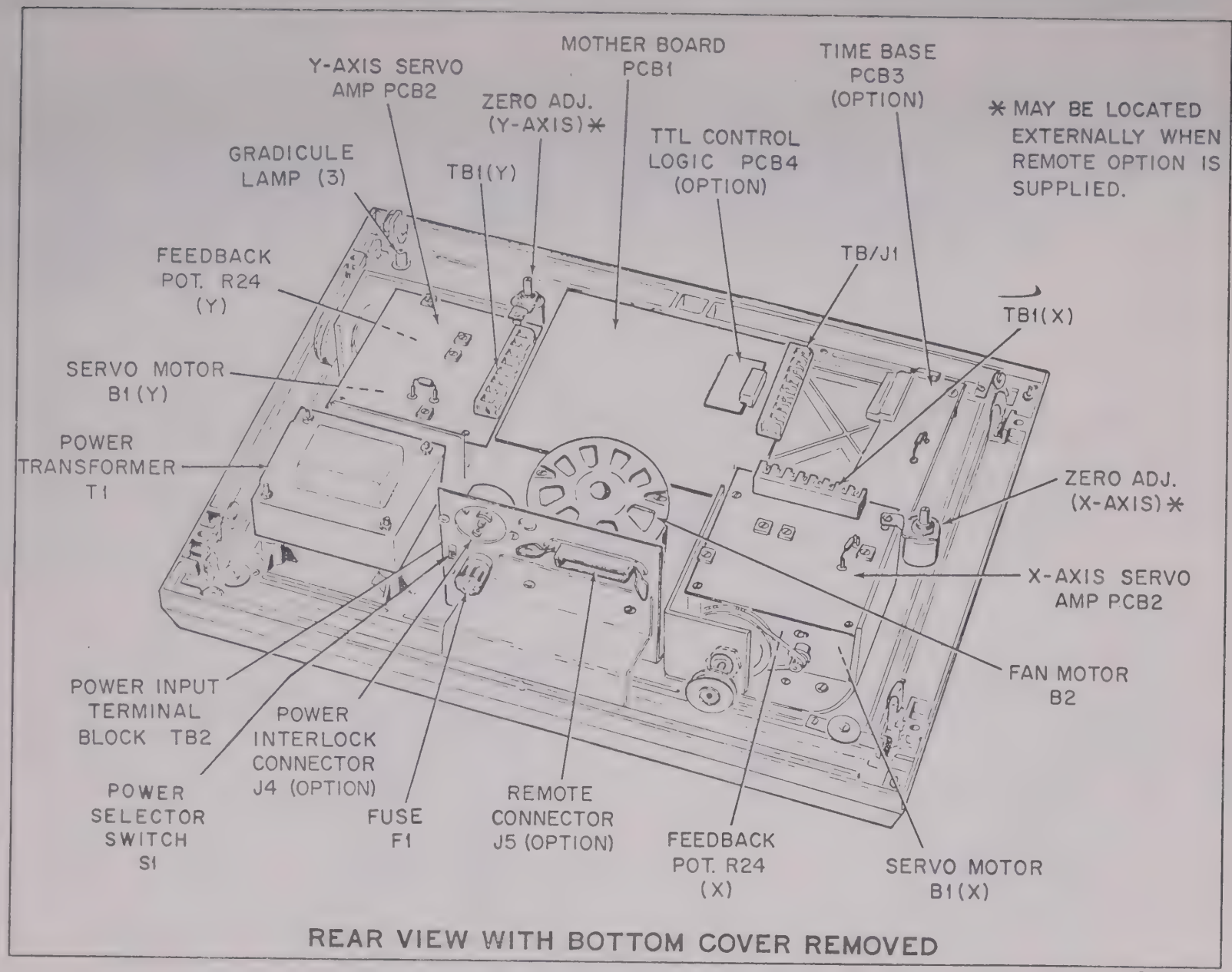


Figure 1-2B. Location of Major Components.

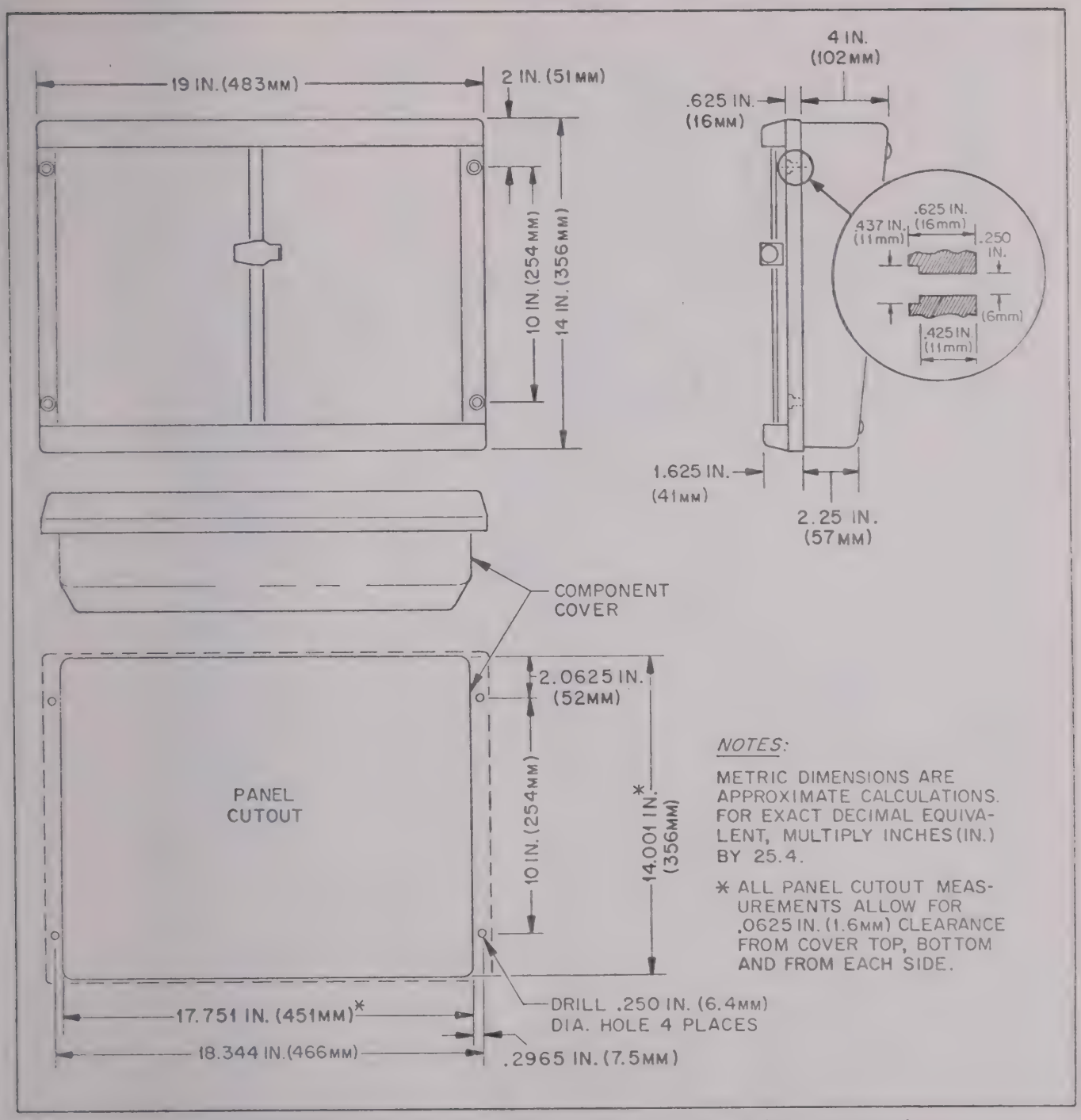


Figure 2-1. Installation and Dimensional Diagram (Basic Model).

NOTE: See Figure 6-1 in SECTION 6 of manual for installation and dimensional diagram of recorder with Control Module (LAB model).

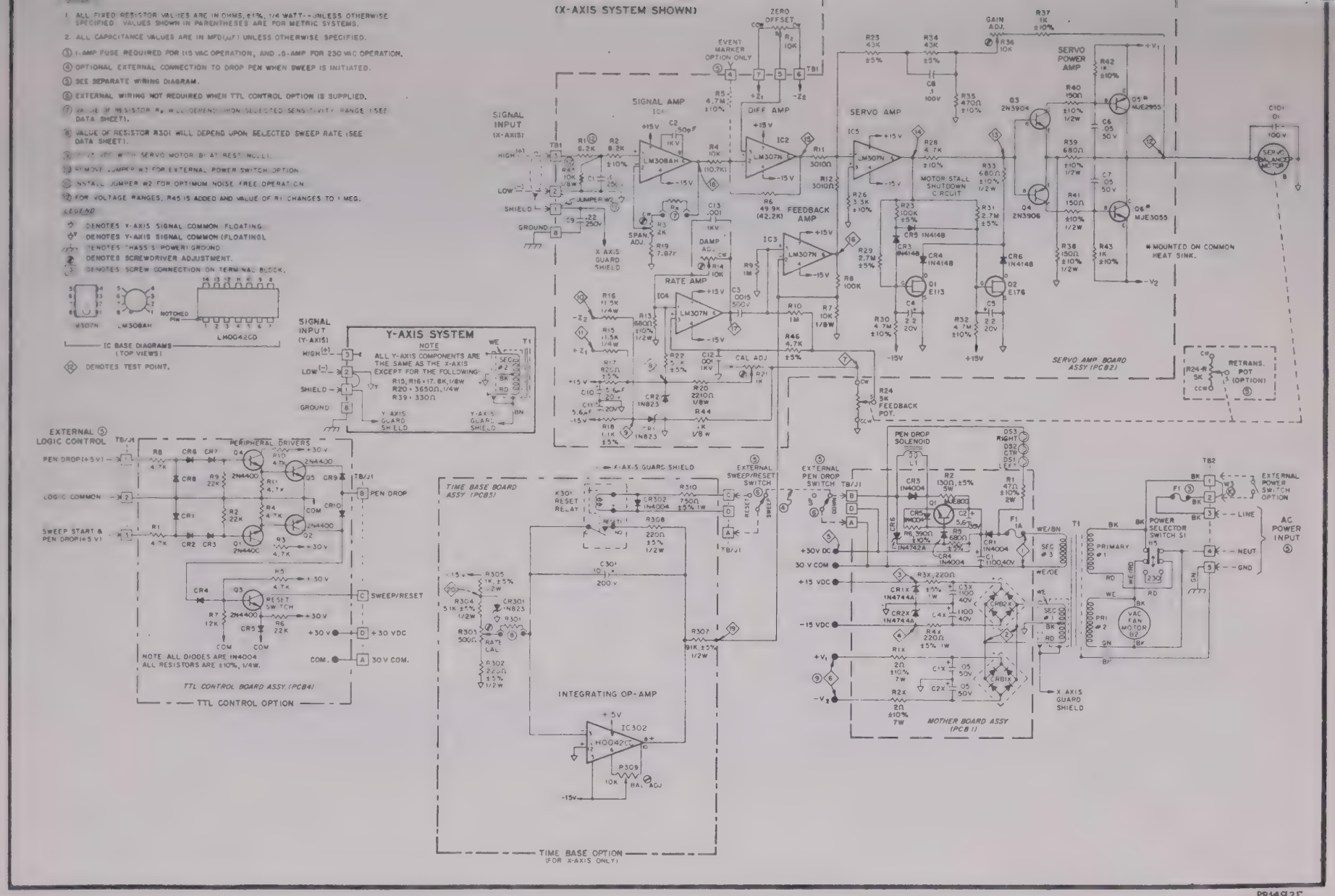

(X-AXIS SYSTEM SHOWN)
NOTES:
1. ALL FIXED RESISTOR VALUES ARE IN OHMS, ±5%, 1/4 WATT - UNLESS OTHERWISE SPECIFIED. VALUES SHOWN IN PARENTHESES ARE FOR METRIC SYSTEMS.
2. ALL CAPACITANCE VALUES ARE IN MFD(μF) UNLESS OTHERWISE SPECIFIED.
3. 1-AMP FUSE REQUIRED FOR 115 VAC OPERATION, AND .6-AMP FOR 230 VAC OPERATION.
4. OPTIONAL EXTERNAL CONNECTION TO DROP PEN WHEN SWEEP IS INITIATED.
5. SEE SEPARATE WIRING DIAGRAM.
6. EXTERNAL WIRING NOT REQUIRED WHEN TTL CONTROL OPTION IS SUPPLIED.
7. VALUE OF RESISTOR Rx WILL DEPEND UPON SELECTED SENSITIVITY RANGE (SEE DATA SHEET).
8. VALUE OF RESISTOR R301 WILL DEPEND UPON SELECTED SWEEP RATE (SEE DATA SHEET).
9. SET VOLT METER FOR SERVO MOTOR BIAS AT REST NULL.
10. REMOVE JUMPER W1 FOR EXTERNAL POWER SWITCH OPTION.
11. INSTALL JUMPER W2 FOR OPTIMUM NOISE FREE OPERATION.
12. FOR VOLTAGE RANGES, R45 IS ADDED AND VALUE OF R1 CHANGES TO 1 MEG.
LEGEND
DENOTES X-AXIS SIGNAL COMMON (FLOATING)
DENOTES Y-AXIS SIGNAL COMMON (FLOATING).
DENOTES CHASSIS POWER GROUND
DENOTES SCREWDRIVER ADJUSTMENT.
DENOTES SCREW CONNECTION ON TERMINAL BLOCK.
IC BASE DIAGRAMS (TOP VIEWS)
DENOTES TEST POINT.
SIGNAL INPUT (X-AXIS)
SIGNAL AMP
DIFF AMP
SERVO AMP
FEEDBACK AMP
RATE AMP
SERVO POWER AMP
MOTOR STALL SHUTDOWN CIRCUIT
SERVO AMP BOARD ASSY (PCB2)
RETRANS. POT (OPTION)
MOUNTED ON COMMON HEAT SINK.
Y-AXIS SYSTEM
NOTE
ALL Y-AXIS COMPONENTS ARE THE SAME AS THE X-AXIS EXCEPT FOR THE FOLLOWING:
R15, R16 = 17.8K, 1/8W
R20 = 3650Ω, 1/4W
R39 = 330Ω
SIGNAL INPUT (Y-AXIS)
EXTERNAL LOGIC CONTROL
PERIPHERAL DRIVERS
PEN DROP (+5V)
LOGIC COMMON
SWEEP START & PEN DROP (+5V)
PEN DROP
SWEEP/RESET
+30 VDC
30 V COM.
NOTE ALL DIODES ARE 1N4004
ALL RESISTORS ARE ±10%, 1/4W.
TTL CONTROL BOARD ASSY (PCB4)
TTL CONTROL OPTION
TIME BASE BOARD ASSY (PCB3)
X-AXIS GUARD SHIELD
K301 RESET RELAY
EXTERNAL SWEEP/RESET SWITCH
INTEGRATING OP-AMP
TIME BASE OPTION (FOR X-AXIS ONLY)
EXTERNAL PEN DROP SWITCH
PEN DROP SOLENOID
+30V DC
30 V COM
+15 VDC
-15 VDC
+V1
-V2
MOTHER BOARD ASSY (PCB1)
X AXIS GUARD SHIELD
POWER SELECTOR SWITCH S1
EXTERNAL POWER SWITCH OPTION
AC POWER INPUT
LINE
NEUT
GND
VAC FAN MOTOR
PRIMARY
SECONDARY

Figure 4-2. Schematic Diagram for Model XY575 Basic (OEM) Recorder.

VOLTAGE CHECK TABLE FOR OEM RECORDERS

TEST POINT LOCATION(◇) IN FIG. 4-2	CHECK CONDITION REQUIREMENT	MEASUREMENT		
		"X" AXIS	"Y" AXIS	POWER SUPPLY
1	None			25V AC
2	"			35V AC
3	"			15V DC
4	"			-15V DC
5	"			30V DC
6 ($+V_1$)	Null Balance			22.7V DC
6 ($+V_1$)	Off-Null Balance			9.7V DC
6 ($-V_2$)	Null Balance			-22.8V DC
6 ($-V_2$)	Off-Null Balance			-9.4V DC
7	None	1.48V DC		
7	"		1V DC	
8	"	6.26V DC	6.26V DC	
9	"	-6.32V DC	-6.32V DC	
10	"	-1.89V DC		
10	"		-1.3V DC	
11	"	1.85V DC		
11	"		1.4V DC	
12	Null Balance	From +.8V to -.8V DC	From +.8V to -.8V DC	
12	Motor Stalled: @ Zero	-8.4V DC		
	@ Full Scale	+8.4V DC		
12	Motor Stalled: @ Zero		-7V DC	
	@ Full Scale		+7V DC	
13	Null Balance	From +1V to -1V DC	From +1V to -1V DC	
13	Motor Stalled: @ Zero	-5.6V DC	-5.6V DC	
	@ Full Scale	+5.6V DC	+5.6V DC	
14	Null Balance	From +2V to -2V DC	From +2V to -2V DC	
14	Motor Stalled: @ Zero	-13V DC	-13V DC	
	@ Full Scale	+13V DC	+13V DC	
15	Shorted Input with ZERO OFFSET Control @ Zero	0V DC	0V DC	
15	Full Scale Input	7.5V DC	5V DC (10" Deflection)	
16	Shorted Input	0V DC	0V DC	
17	Shorted Input	-8.1V DC	-8.1V DC	
17	Full Scale Input	8.7V DC	8.7V DC	
18	Shorted Input	0V DC	0V DC	
18	Full Scale Input	1.5V DC (English Version)	1V DC (English Version)	
18	Full Scale Input	1.9V DC (Metric Version)	1.15V DC (Metric Version)	
19	SWEEP/RESET Switch in RESET position.	0V DC		
19	SWEEP/RESET Switch in SWEEP position.	0 to 2.6V DC		
20	None			6.23V DC

GENERAL NOTES:

1. Measurements taken with DVM.
2. Measured values are taken from point indicated to its common return point, or as otherwise indicated.
3. Measurements apply to either English or Metric version unless otherwise specified.
4. AC input supply voltage maintained at rated value for voltage measurements.

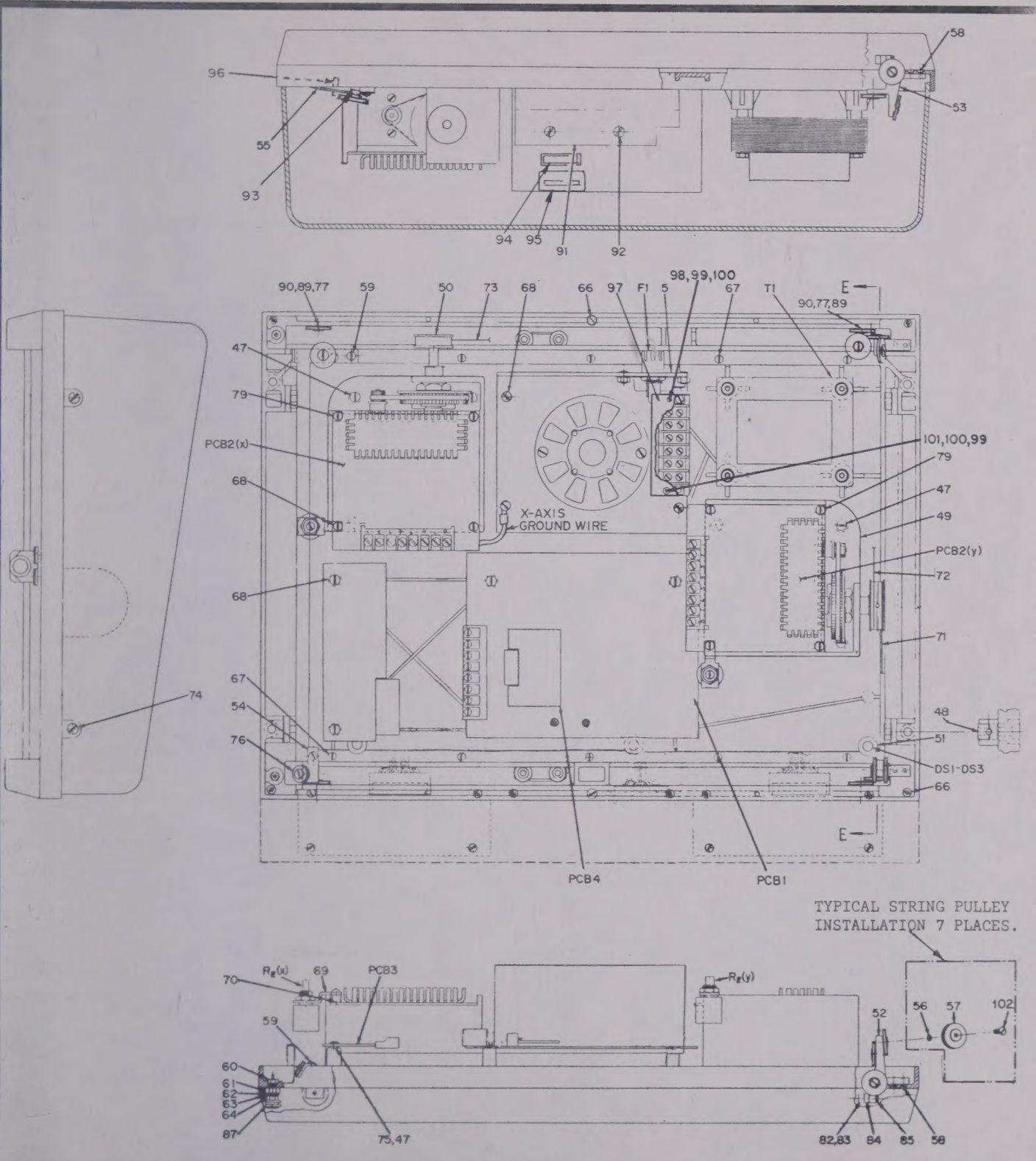


Figure 5-1 (Sheet 1 of 2). Parts Location on Main Assembly.